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EXAMINER				
HAN, SHENG				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com

oblonpat@oblon.com

jgardner@oblon.com

# Office Action Summary

Application No.

10/574,955

Applicant(s)

ADACHI ET AL.

Examiner

SHENG HAN

Art Unit

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-52 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-52 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-518)  
Paper No(s)/Mail Date 4/7/06, 5/27/08, 6/18/08

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 2, 3, 5, 9, 10, 15, 17, 18, 19, 20, 21, 22, 27, 28, 29, 30, 32, 33, 34, 35, 36, 38, 39, 40, 41, 42, 43, 44, 46, 47 and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oesterle (5656140).

Oesterle teaches a method of remediating metallic contaminants from a substance, such as contaminated earth, by first mixing the substance with water and acid (col. 2, lines 38-39) in a container to form a mixture, constituting a dissolution step. The container has a cathode side and an anode side, which are both charged (col. 2, lines 40-39). Application of a voltage results in a reducing atmosphere on the cathode side whereby metal ions deposit upon (col. 2, lines 43-46). The solution within the container is acidic, preferably between 1 and 3 (col. 7, lines 61-63) and this solution is circulated until the separation process is complete (col. 7, lines 67-68 to col. 8, lines 1-4).

Although Oesterle teaches that a dissolution step and a separation step occurs using a plurality of containers, Oesterle does not specifically teach that the vessel with the anodes and cathodes is used for first dissolving and then separating the heavy metals from the contaminated solid material, it would have been obvious to one of ordinary skill in the art at the time of the invention that some of this would obviously occur because of the presence of multiple anodes and Oesterle teaches that there can be multiple cathodes (col. 8, lines 32-34, cathode and anodes can be reversed, which would result in one anode in the center and multiple cathodes surrounding the anode).

Regarding Claims 2 and 3, Oesterle teaches that the voltage can be between 0 and 10 volts (col. 5, lines 20-21). The negative would be the measurement of the volts on the cathode electrode.

Regarding Claim 5, Oesterle teaches a pH of between 1 and 3 (col. 7, lines 61-63).

Regarding Claim 9, Oesterle teaches use of a chamber where a cathode sits in the middle surrounded by a permeable membrane and a plurality of anodes surround the cathode in the chamber, radially from the center of the chamber (Fig. 2). Oesterle however, teaches that the placement of the cathode and anodes can be reversed (col. 8, lines 32-34). Furthermore, Oesterle teaches that a plurality of stages occur involving the separation of sediments in the soil and isolation of the metals (Fig. 1).

Regarding Claim 10, Oesterle teaches use of a plurality of electrodes where there could be a plurality of cathodes and one anode (see rejection for Claim 9). The particles that are designed to be ionized are metal particles (col. 2, line 54 and col. 5, line 8). These particles collect and are deposited onto the cathode portion of the tank (abstract). Furthermore, Oesterle designed a series of tanks whereby there is a slow stripping down of particles prior to the ionization of the metals (Fig. 1). Therefore, although Oesterle does not specifically state that one of the cathodes is used for dissolution and the other is used for electrodeposition, it would have been obvious to

one of ordinary skill in the art at the time of the invention that this would occur with a plurality of cathodes.

Regarding Claim 15, Oesterle teaches a method of remediating metallic contaminants from a substance, such as contaminated earth, by first mixing the substance with water and acid (col. 2, lines 38-39) in a container to form a mixture, constituting a dissolution step. The container has a cathode side and an anode side, which are both charged and separated by a metal ion permeable membrane positioned between the two electrodes (col. 2, lines 40-39 and col. 2, lines 54-55). In this way, the permeable membrane creates a defined anode zone and a cathode zone. Since the cathode provides a reducing environment, the area around the cathode is the reducing atmosphere.

Application of a voltage results in a reducing atmosphere on the cathode side whereby metal ions deposit upon (col. 2, lines 43-46). The solution within the container is acidic, preferably between 1 and 3 (col. 7, lines 61-63) and this solution is circulated until the separation process is complete (col. 7, lines 67-68 to col. 8, lines 1-4). Finally, since both the anode and the cathode ends sit next to each other, it can be interpreted that these two chambers are parallel to one another.

Regarding Claim 17, Oesterle teaches use of a membrane that surrounds the cathode (fig. 3, 18). It would have been obvious to one of ordinary skill in the art at the time of the invention that this membrane would function to reduce the shearing force on

the cathode, while also maintaining a state of contact between the cathode and the slurry.

Regarding Claim 18, Oesterle teaches use of a pump system to push slurry upward into a vessel (Fig. 3, 28 and 50). Although Oesterle does not specifically teach use of a predetermined flow, it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the speed in order to obtain a certain result. Furthermore, it would be inherent that this would suppress the shearing force on the slurry.

Regarding Claim 19, Oesterle teaches use of a slurry containing heavy metals, water and acid (col. 5, lines 39-42) and a slurry drainage port (Fig. 3, 26) for withdrawing slurry from the chamber, and a slurry line that connects to a pump for removing the slurry solution (Fig. 3, 50). Although the pump withdraws from the lower portion rather than the upper portion, it would have been obvious to one of ordinary skill in the art at the time of the invention to withdraw from a lower portion because it would ensure that fewer solid particles would get trapped in the slurry pump if liquid is taken from the top of the vessel.

Regarding Claim 20, Oesterle teaches use of a porous membrane that surrounds the cathode (Fig. 2, 18). Although Oesterle does not teach that the shearing force is reduced by the addition of this porous membrane, it would have been obvious to one of

ordinary skill in the art at the time of the invention that the addition of this membrane would reduce the force because of its position and function in the vessel.

Regarding Claim 21, Oesterle teaches use of a chamber where a cathode sits in the middle surrounded by a permeable membrane and a plurality of anodes surround the cathode in the chamber, radially from the center of the chamber (Fig. 2). Oesterle however, teaches that the placement of the cathode and anodes can be reversed (col. 8, lines 32-34). Furthermore, Oesterle teaches that a plurality of stages occur involving the separation of sediments in the soil and isolation of the metals (Fig.1 ).

Regarding Claim 22, Oesterle teaches use of a plurality of electrodes where there could be a plurality of cathodes and one anode (see rejection for Claim 9). The particles that are designed to ionized are metal particles (col. 2, line 54 and col. 5, line 8). These particles collect and are deposited onto the cathode portion of the tank (abstract). Furthermore, Oesterle designed a series of tanks whereby there is a slow stripping down of particles prior to the ionization of the metals (Fig. 1). Therefore, although Oesterle does not specifically state that one of the cathodes is used for dissolution and the other is used for electrodeposition, it would have been obvious to one of ordinary skill in the art at the time of the invention that this would occur with a plurality of cathodes.

Regarding Claim 27, Oesterle teaches that the permeable membrane surrounds the cathode at the center of the chamber and a plurality of anodes sit outside of the diaphragm, which create an anode zone and a cathode zone (Fig. 2). Oesterle teaches that these electrodes can be reversed, whereby the cathode is in the anode position and the anode, in the cathode position (col. 8, lines 32-34).

Regarding Claim 28, Oesterle teaches that the diaphragm at the center of the chamber is in a cylindrical shape (Fig. 2).

Regarding Claim 29, Oesterle teaches use of a chamber where a cathode sits in the middle surrounded by a permeable membrane and anodes surround the cathode in the chamber, radially from the center of the chamber (Fig. 2). Oesterle however, teaches that the placement of the cathode and anodes can be reversed (col. 8, lines 32-34).

Regarding Claim 30, Oesterle teaches that a diaphragm surrounds the cathode at the center of the chamber, to thereby define a cathode and anode area (Fig. 2 and col. 4, lines 36-40). Oesterle further explains that the relative placement of the cathode and anodes are preferred but can be reversed (col. 8, lines 32-34).

Regarding Claim 32, Oesterle teaches that the diaphragm is cylindrical (Fig. 2, 18).

Regarding Claim 33, please see the rejection for Claim 29.

Regarding Claim 34, Oesterle teaches a method of remediating metallic contaminants from a substance, such as contaminated earth, by first mixing the substance with water and acid (col. 2, lines 38-39) in a container to form a mixture, constituting a dissolution step. The container has a cathode side and an anode side, which are both charged (col. 2, lines 40-39). Application of a voltage results in a reducing atmosphere on the cathode side whereby the metal ionize and charged particles deposit upon it (col. 2, lines 43-46). The solution within the container is acidic, preferably between 1 and 3 (col. 7, lines 61-63) and this solution is circulated until the separation process is complete (col. 7, lines 67-68 to col. 8, lines 1-4). A diaphragm sits between the anode and the cathode ends of the chamber (Fig. 2, 18). Oesterle further discusses how the solution's contact with the anode and the acidic environment, results in the removal of electrons from the metals to positively charge them and break them up into positively charged metal ions (col. 5, lines 60-64). These ions are independently mobile in the mixture, thus making the metal dissolved in the solution. Although Oesterle does not specifically teach that use of a device to supply the solid materials containing the heavy metals into the cathode zone, it would have been obvious to one of ordinary skill in the art at the time of the invention that a means for supplying the heavy metal containing product could be employed, in the system described by Oesterle

because such a feeding device is well known in the art, and would make the process more efficient.

Regarding Claim 35, Oesterle teaches use of the apparatus to treat metal ions in water and acid, where the metals are attracted to the cathode (abstract).

Regarding Claim 36, Oesterle teaches use of a slurry containing heavy metals, water and acid (col. 5, lines 39-42).

Regarding Claim 37, Oesterle teaches use of a slurry drainage port (Fig. 3, 26) for withdrawing slurry from the chamber, and a slurry line that connects to a pump for removing the slurry solution (Fig. 3, 50).

Regarding Claim 38, Please see the rejection for Claim 37. Furthermore, Oesterle teaches that the slurry drainage line (Fig. 2, 26) is connected to the permeable membrane in the chamber (col. 4, lines 45-48). This membrane ensures that larger solid object do not pass through to the drainage port (col. 4, lines 45-48).

Regarding Claim 39, Oesterle teaches use of air or gas as method to circulate the mixture (col. 4, line 49). Oesterle further teaches that some of the mixture is introduced into a pump and recycled back into the system to promote a mixing (col. 4, lines 42-45). Therefore, it would have been obvious to one of ordinary skill in the art at

the time of the invention to use a stirrer to the mixture for distributing the particles in the slurry.

Regarding Claim 40, please see the rejection for Claim 29.

Regarding Claim 41, Oesterle teaches use of a cylindrical diaphragm (Fig. 2, 18).

Regarding Claim 42, Oesterle teaches use of a chamber where a cathode sits in the middle surrounded by a permeable membrane and anodes surround the cathode in the chamber, radially from the center of the chamber (Fig. 2). Oesterle however, teaches that the placement of the cathode and anodes can be reversed (col. 8, lines 32-34).

Regarding Claim 43, Oesterle teaches use of a plurality of anodes, but further teaches that the cathodes and anodes could be switched such that there would be a plurality of cathodes and one anode in the center (col. 8, lines 32-34).

Regarding Claim 44, Oesterle teaches method of isolating metal ions in a slurry by using a chamber with electrodes that include both anodes and cathodes that ionize the metal particles, which collect on the electrodes. Oesterle teaches using a pump that brings slurry from the bottom of the tank to the top of the tank. Although it is unclear whether there is a predetermined flow rate, it would have been obvious to one of

ordinary skill in the art at the time of the invention to adjust the pump and electrode potential in a way that would optimize the result of the electrodeposition of metal particles.

Regarding Claim 46, Oesterle teaches use of a porous partition wall that surrounds the cathode (Fig. 2, 18). It would have been obvious to one of ordinary skill in the art at the time of the invention that it would serve to reduce the shearing force on the cathode.

Regarding Claim 47, Oesterle teaches use of a plurality of electrodes where there could be a plurality of cathodes and one anode (see rejection for Claim 9). The particles that are designed to ionized are metal particles (col. 2, line 54 and col. 5, line 8). These particles collect and are deposited onto the cathode portion of the tank (abstract). Furthermore, Oesterle designed a series of tanks whereby there is a slow stripping down of particles prior to the ionization of the metals (Fig. 1). Therefore, although Oesterle does not specifically state that one of the cathodes is used for dissolution and the other is used for electrodeposition, it would have been obvious to one of ordinary skill in the art at the time of the invention that this would occur with a plurality of cathodes.

Regarding Claim 52, Oesterle teaches use of a slurry pump that pulls slurry from the tank back into the cathode zone (Fig. 3).

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oesterle as applied to claim 1 above, and further in view of Goto (5958213).

Oesterle teaches a method of removing metallic contaminants using a process that involves dissolving the product in solution and then powering the electrodes, such that metal contaminants would collect on the cathode side. Oesterle teaches that the voltage can be anywhere between 0 to 10 volts, but does not specifically teach what that current density would be.

Goto teaches a water treating apparatus for treating a liquid stream using a electrolyzer with an anode and a cathode (col. 4, lines 41-43). The current density used is less than 0.1 A/L (col. 4, lines 41-45).

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply a current density, as taught by Goto, with the system as taught by Oesterle because it is a known current density for performing the same a known and similar function.

Claim 6, 7, 11, 12, 13, 14, 16, 23, 24, 25, 26, 31, 48 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oesterle as applied to claims 1, 15, 22, 30 and 34 above, and further in view of Beer (4670114).

Oesterle teaches use of a circulator which moves the mixture around in the solution according to a flow path (col. 2, lines 49-50), but does not teach use of a flow that obvious the shearing force of the mixing path. It would have been obvious to one of

ordinary skill in the art at the time of the invention however, to maintain the flow such that it would not disturb the collected film of metallic particles along the cathode side of the container so as to undo all electrolyzing effect of the container.

However, Beer teaches method of isolating metal ions from a liquid slurry using electrodes, a permeable membrane and an upward bubbling in the slurry, whereby air is bubbled through the solution col. 4, lines 52-55). Beer discusses that there are migrating ions in the solution (col. 4, line 23).

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply a bubbling up of air or gas in the slurry, as taught by Beer, with the system, as taught by Oesterle in order to agitate the mixture so as to aid metal ions move toward the electrodes.

Regarding Claim 7, Beer teaches that air is bubbled through the solution from the bottom of the tank so that the bubbles go upward. This process inherent will cause a particle gradient in the solution.

Regarding Claim 11, Beer teaches use of a plurality of anodes and one cathode, where the anodes are spaced differently from the cathode (Fig. 4) for the use of ionizing iron and nickel (Fig. 4). As illustrated in Fig. 4, the cathode is spaced differently from the anodes on both sides of the tank (fig. 4). Further, Beer teaches the use of different voltage potentials for the dissolution of varying metal salts (col. 7, lines 5-10).

Although Beer uses a plurality of anodes rather than cathodes, it would have been further obvious to one of ordinary skill in the art at the time of the invention to modify the number of anodes or cathodes used according to the ionization state of the compounds to be deposited on the electrode. As discussed in Oesterle, it would have been obvious to one of ordinary skill in the art at the time of the invention to replace the anodes with the cathodes depending on the nature of the compound dissolved in the solution.

Regarding Claim 12, Beer teaches that the anodes are supplied at different current densities so that each can dissolve the varying metal compositions in the solution (col. 7, lines 6-14). Although Beer does not specifically teach use of the cathodes to perform this dissolution, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply to switch the anode and the cathodes, as taught by Oesterle, with the system as taught by Beer because depositing the metal ions on the electrode depends on the natural ionization state of the mineral. It would be obvious to use predominately cathodes if the mineral ionized was a anion whereas it would be obvious to a plurality of anodes if the mineral chosen to be ionized was a cation.

Regarding Claim 13, please see the rejection for Claim 12. Additionally, since Beer teaches use of varying electrical potentials of electrodes, it would have been obvious to one of ordinary skill in the art at the time of the invention that some of these

voltages would dissolve the metal salts and others would cause a metal deposition on the electrode.

Regarding Claim 14, please see the rejection for Claim 13 above. Furthermore, since Beer teaches use of varying electrical potentials of electrodes, it would have been obvious to one of ordinary skill in the art at the time of the invention that some of these voltages would dissolve the metal salts and others would cause a metal deposition on the electrode.

Regarding Claim 16, Beer teaches that the pH of the solution is adjusted by bubbling in acid or basic solution (abstract).

Regarding Claim 23, Beer teaches use of a plurality of anodes and one cathode, where the anodes are spaced differently from the cathode (Fig. 4) for the use of ionizing iron and nickel (Fig. 4). As illustrated in Fig. 4, the cathode is spaced differently from the anodes on both sides of the tank (fig. 4). Further, Beer teaches the use of different voltage potentials for the dissolution of varying metal salts (col. 7, lines 5-10).

Although Beer uses a plurality of anodes rather than cathodes, it would have been further obvious to one of ordinary skill in the art at the time of the invention to modify the number of anodes or cathodes used according to the ionization state of the compounds to be deposited on the electrode. As discussed in Oesterle, it would have further been obvious to one of ordinary skill in the art at the time of the invention to

replace the anodes with the cathodes depending on the nature of the compound dissolved in the solution.

Regarding Claim 24, Beer teaches that the anodes are supplied at different current densities so that each can dissolve the varying metal compositions in the solution (col. 7, lines 6-14). Although Beer does not specifically teach use of the cathodes to perform this dissolution, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply to switch the anode and the cathodes, as taught by Oesterle, with the system as taught by Beer because depositing the metal ions on the electrode depends on the natural ionization state of the mineral. It would be obvious to use predominately cathodes if the mineral ionized was an anion whereas it would be obvious to a plurality of anodes if the mineral chosen to be ionized was a cation.

Regarding Claim 25, please see the rejection for Claim 24. Additionally, since Beer teaches use of varying electrical potentials of electrodes, it would have been obvious to one of ordinary skill in the art at the time of the invention that some of these voltages would dissolve the metal salts and others would cause a metal deposition on the electrode.

Regarding Claim 26, please see the rejection for Claim 25 above. Furthermore, since Beer teaches use of varying electrical potentials of electrodes, it would have been

obvious to one of ordinary skill in the art at the time of the invention that some of these voltages would dissolve the metal salts and others would cause a metal deposition on the electrode.

Regarding Claim 31, please see the rejection for claim 16.

Regarding Claim 48, Beer teaches use of a plurality of anodes and one cathode, where the anodes are spaced differently from the cathode (Fig. 4) for the use of ionizing iron and nickel (Fig. 4). As illustrated in Fig. 4, the cathode is spaced differently from the anodes on both sides of the tank (fig. 4). Further, Beer teaches the use of different voltage potentials for the dissolution of varying metal salts (col. 7, lines 5-10). It would be inherent for the metal to deposit on the cathode closest to the anode.

Furthermore, although Beer uses a plurality of anodes rather than cathodes, it would have been further obvious to one of ordinary skill in the art at the time of the invention to modify the number of anodes or cathodes used, as discussed by Oesterle, according to the ionization state of the compounds to be deposited on the electrode.

Regarding Claim 49, please see the rejection for Claim 48. Additionally, since Beer teaches use of varying electrical potentials of electrodes, it would have been obvious to one of ordinary skill in the art at the time of the invention that some of these voltages would dissolve the metal salts and others would cause a metal deposition on the electrode.

Claims 8, 44 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oesterle and Beer as applied to claim 7 and 34 above, and further in view of Thompson III (5873986).

Oesterle and Beer teach method of isolating metal ions from a liquid slurry using electrodes, a permeable membrane and an upward bubbling in the slurry, but do not specifically teach use of a upward flow of slurry to distribute particle size.

Thompson teaches a method of isolating metal particles by using electrodes and a swirling effect (abstract). Thompson further discusses use of an upward flow of slurry into the tank in order to encourage deposition of the metal particles on the electrode surface (col. 3, lines 33-55).

Although Thompson does not specifically teach that the purpose of using the upward flow of slurry is to redistribute the particle size, it is inherent that this would occur.

Furthermore, since the larger metal particles are more likely to settle on the bottom of the tank, it would have been obvious to one of ordinary skill in the art at the time of the invention to use an upward flow of slurry, as taught by Thompson, with the system as taught by Oesterle and Beer because it would reintroduce metal particles up to the electrodes to be either ionized or deposited on the electrode.

Regarding Claim 45, Oesterle and Beer teach a method of isolating metal ions in a slurry, with a slurry withdrawal port at the bottom part of the vessel and a slurry

introduction port at a middle part of the vessel using a circulation pump (Fig. 3). It would have been obvious to one of ordinary skill in the art at the time of the invention to feel the slurry the other way around because there would be less chance of the pump clogging with the larger particles that settle on the bottom of the tank being fed through the pump. Beer teaches use of air bubbles in the slurry, but neither reference teaches use of an upward flow of slurry from a lower part of the tank to an upper part of the tank at a predetermined flow rate.

Thompson teaches a method of isolating metal particles by using electrodes and a swirling effect (abstract). Thompson further discusses use of an upward flow of slurry into the tank in order to encourage deposition of the metal particles on the electrode surface (col. 3, lines 33-55).

Furthermore, since the larger metal particles are more likely to settle on the bottom of the tank, it would have been obvious to one of ordinary skill in the art at the time of the invention to use an upward flow of slurry, as taught by Thompson, with the system as taught by Oesterle because it would reintroduce metal particles up to the electrodes to be either ionized or deposited on the electrode.

Claims 9, 10, 13, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oesterle as applied to claims 1 and 15 above, and further in view of Pushpavanam (2005/0167285).

Oesterle teaches a method of removing metallic contaminants using a process that involves dissolving the product in solution and then powering the electrodes, such

that metal contaminants would collect on the cathode side. Oesterle teaches that the voltage can be anywhere between 0 to 10 volts, but does not specifically teach what that current density would be.

Pushpavanam discusses an electrochemical method for clarifying a liquid stream contaminated with arsenate (abstract) that involves maintaining the heavy metal in an aqueous solution (para. 0011). This system involves the use of an electrode system, whereby a cathode and an anode are employed. The pH of the solution is alkaline (para. 0011). Furthermore, the current density of the solution is 0.05 to 0.2  $\text{Adm}^{-2}$  (Table, line 5, cathode current density). Finally, Pushpavanam teaches that there are a plurality of cathodes (0043).

It would have been obvious to one of ordinary skill in the art at the time of the invention that the current density would be about .05 to 0.2  $\text{Adm}^{-2}$ , as taught by Pushpavanam, with the system as taught by Oesterle because it is a known density used to perform a known and similar function.

Regarding Claim 21, please see the rejection for Claim 9.

Claims 11, 50, 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oesterle and Pushpavanam as applied to Claims 9 and 34, and further in view of Gasser (6387243).

Oesterle and Pushpavanam teach methods of removing contaminants from a liquid stream using electrodes with a semi-permeable membrane separating the

electrodes in a chamber by employing a certain voltage and a certain general pH that is either acidic or alkaline.

Gasser teaches a method of separating metal ions using electrolysis by dissolving the metal ions in a polar solvent (col. 5, lines 41-42 and abstract) and applying a circulating current to the electrolyte (col. 4, lines 2-7) for the deposition of the metal on the electrodes. Moreover, Gasser teaches that the tank can include more than one cathode which can be set at either another voltage potential or be made from a different material so as to dissolve or attract a different metal substance (col. 4, lines 14-17). A diaphragm separates the anode from the cathode (col. 11, lines 56 and col. 11, lines 35-37). The solution of the slurry is maintained in an acidic condition (col. 8, lines 25-27).

Although Gasser does not specifically teach that one of the cathodes is for dissolving and another is for ionizing, it would have been obvious to one of ordinary skill in the art at the time of the invention that since there are a plurality of cathodes used in the system, some being made of different material to others, (and some being closer to the anode) that some would be used for dissolving and other for ionization.

Regarding Claim 50, Glasser teaches use of a plurality of cathodes, which can have different electrical potentials (col. 4, lines 9-17). It would have been obvious to one of ordinary skill in the art at the time of the invention that some of these electrodes would be used predominately for deposition and others would function primarily for dissolution.

Regarding Claim 51, Glasser teaches use of multiple cathodes which can have varying electrical potentials (col. 4, lines 9-17). It would have been obvious to one of ordinary skill in the art at the time of the invention that some of these electrodes would be use predominately for deposition and others would function primarily for dissolution.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SHENG HAN whose telephone number is (571)270-5823. The examiner can normally be reached on Monday-Thursday, 7:30-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Melvin Curtis Mayes can be reached on 571-272-1234. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Sheng Han  
Examiner  
Art Unit 1793

SH  
February 13, 2009

/Melvin Curtis Mayes/  
Supervisory Patent Examiner, Art Unit 1793